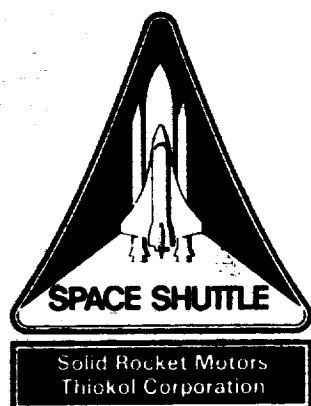


**TWR-17546  
Vol VII**



# **Flight Set 360L007 (STS-33R) Field Joint Protection System, Thermal Protection System, and Systems Tunnel Components Final Report—Volume VII**

**September 1990**

**Prepared for:**

**National Aeronautics and Space Administration  
George C. Marshall Space Flight Center  
Marshall Space Flight Center, Alabama 35812**

**Contract No. NAS8-30490  
DR No. 3-5  
WBS No. 4B601-03-08  
ECS No. SS-1015**

***Thiokol* CORPORATION  
SPACE OPERATIONS**

*P.O. Box 707, Brigham City, UT 84302-0707 (801) 863-3511*

**Publications No. 91190**

(NASA-CR-184026) FLIGHT SET 360L007  
(STS-33R) FIELD JOINT PROTECTION SYSTEM,  
THERMAL PROTECTION SYSTEM, AND SYSTEMS  
TUNNEL COMPONENTS, VOLUME 7 Final Report  
(Thiokol Corp.) 36 p

N91-10115

Unclass  
0302735

CSCL 21H 63/20

Flight Set 360L007 (STS-33R)  
Field Joint Protection System,  
Thermal Protection System, and  
Systems Tunnel Components  
Final Report  
Volume VII

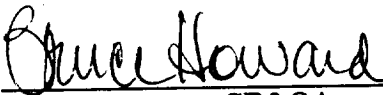
Prepared by:

  
Stage Hardware Design Engineer


Approved by:

  
Supervisor  
Stage Hardware Design

  
System Integration Engineer

 9/13/90  
SR&QA

 9-12-90  
Program Manager

 9-13-90  
Data Management  
ECS SS-1015



## ABSTRACT

This report documents the performance of the thermal protection system, field joint protection system, and systems tunnel components of flight set 360L007 as evaluated by postflight hardware inspection.

The condition of both motors was similar to previous flights. Four aft edge strikes were noted on the ground environment instrumentation thermal protection system. The hits all left a clean substrate, indicating that the damage was caused by nozzle severance debris and/or water impact. No National Space Transportation System debris criteria for missing thermal protection system were violated.

Two problem reports were written against the field joint protection system. The first concerned two cracks in the K5NA closeout over the trunnion/vent valve location on the left-hand aft field joint. A similar condition was observed on Flight 5 (360H005B). The second problem report referred to a number of small surface cracks between two impact marks on the left-hand forward field joint. Neither area exhibited loose material or any abnormal heat effects, and they have no impact on flight safety.

## CONTENTS

<u>Section</u>		<u>Page</u>
1	INTRODUCTION . . . . .	1
2	OBJECTIVE . . . . .	4
3	SUMMARY . . . . .	5
4	CONCLUSIONS/RECOMMENDATIONS . . . . .	6
5	DISCUSSION . . . . .	7
5.1	PREFLIGHT HEATER CONTROL SYSTEM AND PERFORMANCE . . . . .	7
5.2	POSTFLIGHT INSPECTION OF FJPS, TPS, SYSTEMS TUNNEL, AND IGNITER HEATER INSTALLATION . . . . .	7
5.2.1	Field Joint Protection System . . . . .	8
5.2.2	Thermal Protection System . . . . .	11
5.2.3	Systems Tunnel . . . . .	11
5.2.4	Igniter Heater and Forward Dome Power Cable Installation . . . . .	11
6	REFERENCES . . . . .	12

## APPENDIXES

### Appendix

A	LH Aft Field Joint Anomaly Documentation . . . . .	A-1
B	LH Forward Field Joint Anomaly Documentation . . . . .	B-1

## FIGURES

<u>Figure</u>		<u>Page</u>
1	Field Joint Protection System . . . . .	2
2	Igniter-to-Case Joint Heater Configuration . . . . .	3
3	Impact Marks on FJPS Cork (LH forward field joint) . . . . .	9
4	Splits in K5NA Ablation Compound (LH aft field joint) . . . . .	10

## ACRONYMS

deg . . . . .	degree
FJPS . . . . .	field joint protection system
ft . . . . .	feet
GEI . . . . .	ground environment instrumentation
hr . . . . .	hour
in. . . . .	inch
IPR . . . . .	interim problem report
JPS . . . . .	joint protection system
KSC . . . . .	Kennedy Space Center
L . . . . .	launch
LCC . . . . .	launch commit criteria
LH . . . . .	left hand
NSTS . . . . .	National Space Transportation System
PEEL . . . . .	Postflight Engineering Evaluation Limit
RH . . . . .	right hand
RSRM . . . . .	redesigned solid rocket motor
SRB . . . . .	solid rocket booster
STS . . . . .	Space Transportation System
TPS . . . . .	thermal protection system
V . . . . .	volt
°F . . . . .	degrees Fahrenheit

1

## INTRODUCTION

STS-33R was launched from Kennedy Space Center (KSC) on 22 Nov 1989. Two redesigned solid rocket motors (RSRM) were used and were designated 360L007A and 360L007B. The three field joints on each motor (total of six field joints) were protected by the field joint protection system (FJPS) (Figure 1). The FJPS is used to keep the field joint O-rings above the minimum launch commit criteria (LCC) temperature during the launch countdown, to keep rain water from entering the field joint, and to protect the joint components from aerodynamic heating during flight. The igniter-to-case joint on each RSRM was fitted with an igniter heater to keep the igniter seals above minimum LCC temperature requirements during launch countdown (Figure 2).

The ground environment instrumentation (GEI) and heater power cables are protected by the thermal protection system (TPS). The purpose of the TPS is to protect the GEI and heater systems from aeroheating during flight.

After solid rocket booster (SRB) separation and splashdown, the SRBs were recovered and towed to KSC's Hangar AF for postflight inspection and disassembly. Retrieval and tow-back were delayed 24 hr by high sea states. The FJPS, TPS, systems tunnel, and igniter heater installation inspections were performed per Postflight Engineering and Evaluation Plan TWR-50050, Vol I (Reference 1).

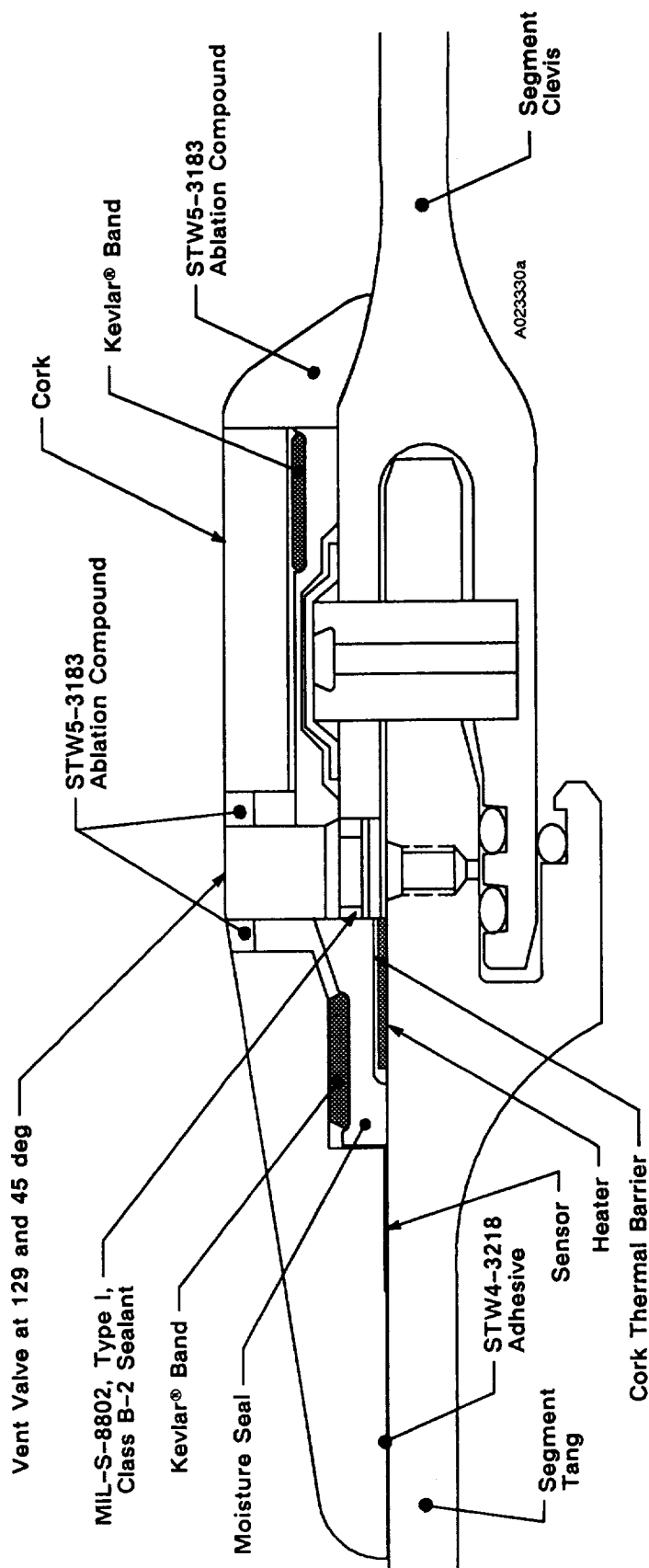


Figure 1. Field Joint Protection System



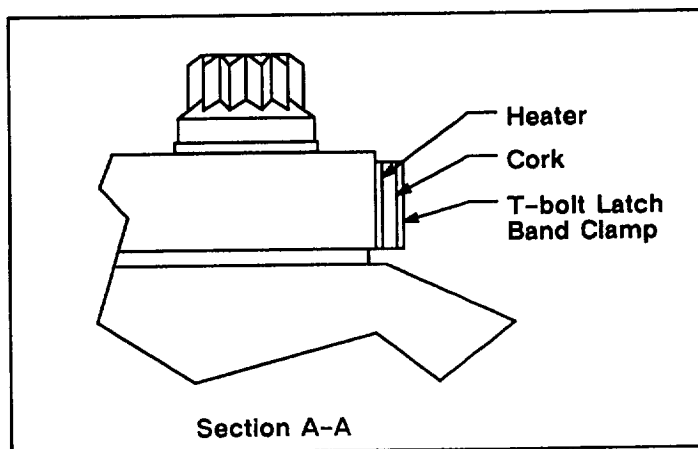
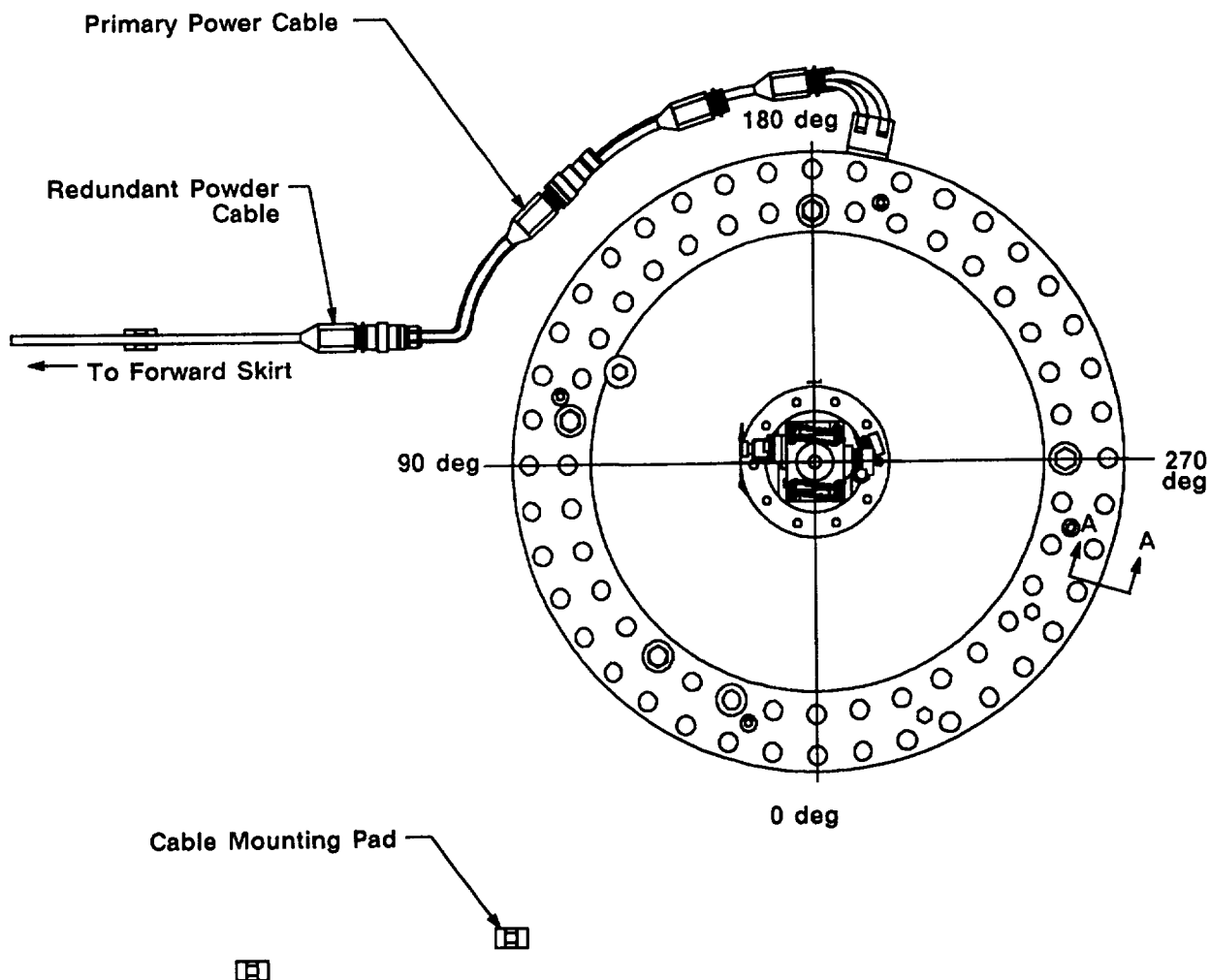


Figure 2. Igniter-to-Case Joint Heater Configuration

2

## OBJECTIVE

The objective of this report is to document any heater anomalies during the launch countdown and any anomalies to the FJPS, TPS, or systems tunnel components during flight and recovery operations. This report will also address all squawks or problem reports initiated during postflight evaluation.

**3**

**SUMMARY**

Postflight assessment results indicate that all TPS and systems tunnel components were in very good to excellent condition (compared to previous flights) with typical flight heat effects and erosion. No squawks or problem reports were written against the TPS or systems tunnel. There were a total of four aft edge hits: three on the left-hand (LH) motor and one on the right-hand (RH) motor, with the largest missing piece of TPS cork measuring 2.5 by 2.5 by 0.5 inches. The hits all left a clean substrate, indicating that the damage was caused by nozzle severance debris and/or water impact. No Postflight Engineering Evaluation Limit (PEEL) requirements or National Space Transportation System (NSTS) debris criteria for missing TPS were violated.

Two anomalies were observed on the LH aft and LH forward field joints and were documented as Problem Reports PV-6-146407 and PV-6-146109, respectively. The anomaly in the LH aft field joint consisted of two circumferential cracks in the K5NA closeout over the trunnion/vent valve location. The cracks were about 2 in. long and did not exhibit loose material or any abnormal heat effects. The LH forward field joint had two small impact marks on the forward edge and a series of small surface cracks in between. These also showed no abnormal heat effects.

## CONCLUSIONS/ RECOMMENDATIONS

The joint protection system (JPS) heaters performed as expected and maintained the field joint temperatures within the LCC required range during launch countdown. Postflight inspection verified that the TPS, FJPS, and systems tunnel all performed as designed, with typical flight heat effects and erosion. The two anomalies reported on the FJPS did not exhibit loose material or any abnormal heat effects and had no impact on flight safety or schedule.

5

## DISCUSSION

### 5.1 PREFLIGHT HEATER CONTROL SYSTEM AND PERFORMANCE

The field joint heaters and igniter-to-case joint heaters performed nominally during the launch countdown. The igniter heaters were activated between L - 24 hr and L - 6 hr 20 minutes, and maintained the joints within the LCC temperature limits of 90° to 108°F at all times. However, the temperature control band was changed from 95° ±5°F to 95° ±1°F, resulting in more frequent cycling and better heater control.

The field joint heaters were activated between L - 11 hr 20 minutes and L - 1 minute, and maintained an acceptable 17°F sensor temperature range from 90° to 107°F during the LCC timeframe. Prior to launch, an LCC contingency was created to lower the minimum redline temperature at any field joint from 85° to 69°F in the event of a complete heater failure. An interim problem report (IPR) was written against the LH aft field joint heater, which read 290 V instead of the nominal 209 V. This IPR was dispositioned when it was determined that the voltage must have been nominal since the current reading was nominal. In addition, the heater circuit breaker was not tripped, as it would have been had the voltage actually been 290 V.

### 5.2 POSTFLIGHT INSPECTION OF FJPS, TPS, SYSTEMS TUNNEL, AND IGNITER HEATER INSTALLATION

The condition of both motors was similar to previous flight motors, with most of the heat effects occurring on the inboard side of the aft segments. These areas experience high aerodynamic heating normal to protuberance components. They also receive the high plume radiation and base recirculation heating induced by the adjacent SRB and space shuttle main engines on the aft-facing surfaces. There was slight charring of the TPS over the GEI cabling runs in this area, typical of previous flights.

### 5.2.1 Field Joint Protection System

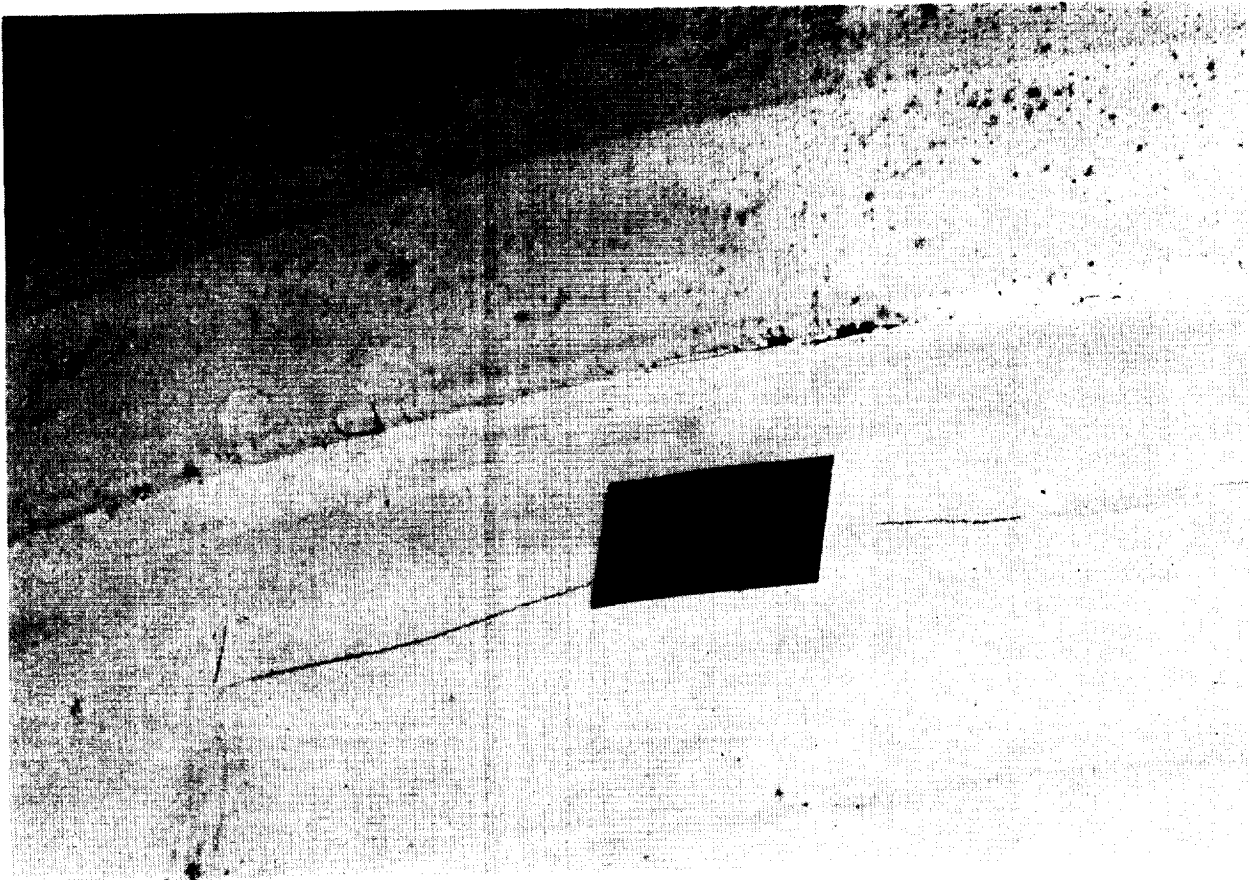
The FJPS was in good condition overall. There were no signs of ablation on any of the JPS, with only slight paint blistering on the cork cover. The paint on the K5NA closeout aft of the cork was also slightly darkened and blistered, with occasional pitting. This condition was typical of previous flights and was probably due to aerodynamic heating and the result of nozzle severance debris and water impact.

Numerous small cracks were observed on the forward edge of the LH forward FJPS cork between 240 and 260 deg (Figure 3). Impact marks were noted on each side of the affected area approximately 3 ft apart. Problem Report PV-6-146407 was written against these cracks (Appendix A). The cracks measured approximately 0.50 in. axially by less than 0.10 in. radially and were within the current material acceptance requirements. The impact marks were most likely caused by a parachute float line. A limit was added to the PEEL stating that cracks in the FJPS that meet current acceptance criteria are acceptable and should not be reported.

Two circumferential cracks were found in the K5NA closeout over the trunnion/vent valve on the LH aft field joint at approximately 30 deg (Figure 4). The cracks were parallel (about 1.25 in. apart) and measured approximately 2.0 in. wide by less than 0.10 in. deep. The K5NA around the cracks was bulged out about 0.10 in. and could be depressed approximately 0.10 in. with hand pressure. Problem Report PV-6-146109 was written against these cracks (Appendix A). This condition was noted on a previous flight (360H005), and it was determined that a vacuum (due to vent valve operation) developed under the moisture seal during descent. This caused the moisture seal to be pulled down over the pin retainer band trunnion. The resulting stress in the K5NA induced a split. Since the condition occurred after SRB separation, there is no impact on flight safety and no corrective action was taken.

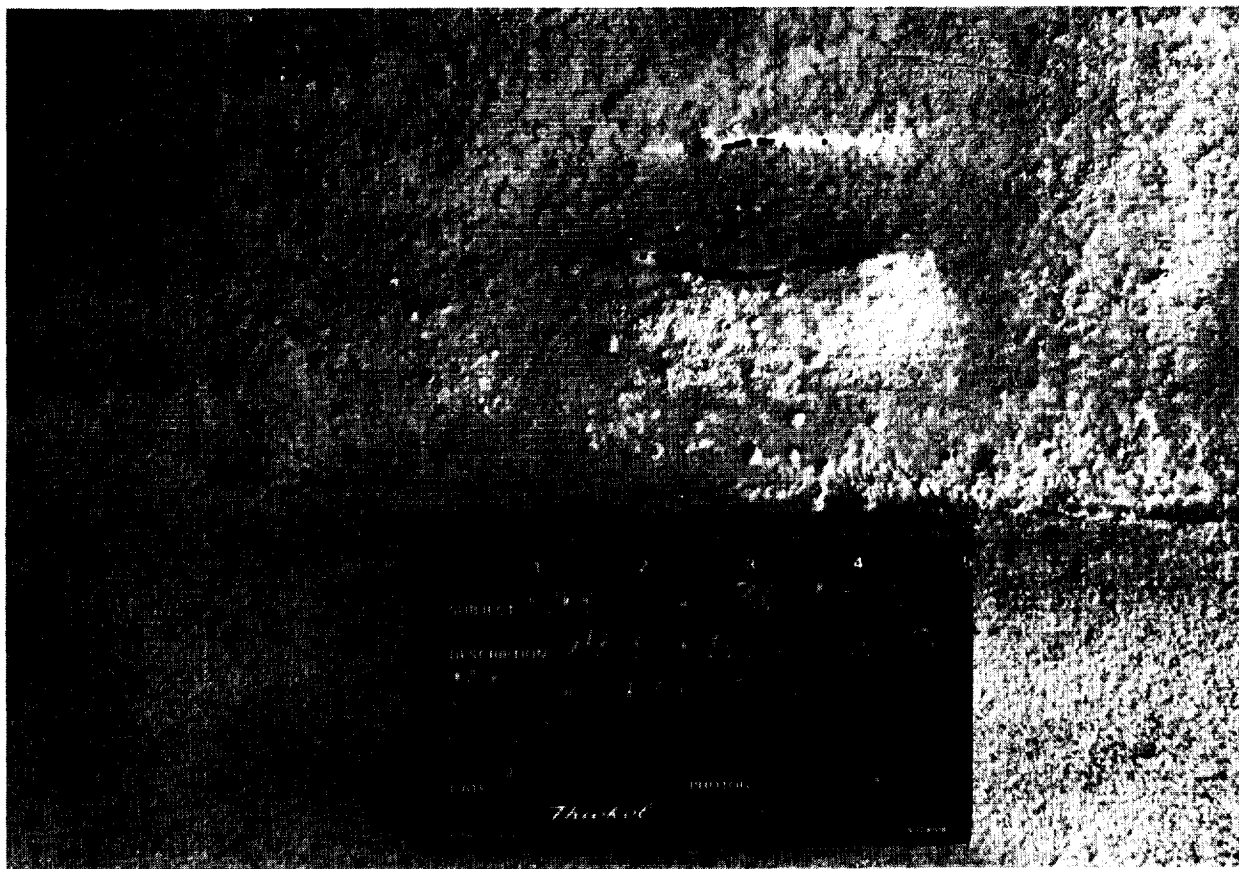
A 4- by 2-in. local blister was observed on the LH center field joint at 45 deg. There was peeling of the Hypalon paint in the area and cork was eroded from the surface approximately 0.05 to 0.10 in. deep. This damage was a first-time occurrence and was probably caused by burning debris from the nozzle severance system. No squawks or problem reports were written against this condition.

ORIGINAL PAGE  
BLACK AND WHITE PHOTOGRAPH



**Figure 3. Impact Marks on FJPS Cork  
(LH forward field joint)**

ORIGINAL PAGE  
BLACK AND WHITE PHOTOGRAPH



**Figure 4. Splits in K5NA Ablation Compound  
(LH aft field joint)**



### 5.2.2 Thermal Protection System

TPS performance was considered to be excellent during flight operation, with typical heat effects and no ablation. There were no in-flight anomalies, squawks, or problem reports written against the TPS.

There were a total of four aft edge hits: three on the LH forward center segment and one on the RH forward segment. The TPS cork pieces that were missing all left a clean substrate, indicating that the hits were caused by nozzle severance debris and/or water impact. The largest GEI cork piece missing was approximately 2.5 by 2.5 by 0.5 in., or 3.1 in.<sup>3</sup>. This piece was located at Station 691 on the RH forward segment at approximately 240 deg. No PEEL requirements or NSTS debris criteria for missing TPS were violated.

### 5.2.3 Systems Tunnel

The cork TPS adjacent to the systems tunnel floor plate was in excellent condition. There was very little paint blistering, and all K5NA closeouts over cables and tunnel seams were in excellent condition. No in-flight anomalies, squawks, or problem reports were written against the systems tunnel.

### 5.2.4 Igniter Heater and Forward Dome Power Cable Installation

Postflight inspection of the igniter heater installation and power cables revealed no anomalies. The igniter heater, cork, and band clamp were removed and inspected at Hangar AF; no anomalies were noted.

6

**REFERENCES**

1. TWR-50050 Vol I, Book I, Rev A, KSC Postflight Engineering Evaluation Plan (Internal and External Insulation), L. E. MacCauley and T. Morgan, 21 Nov 1989.
2. TWR-17432, KSC Ten-Day Postflight Hardware Evaluation Report for 360L007, L. E. MacCauley and T. Morgan, 18 Dec 1989.
3. TWR-17546 Vol I, Flight Motor Set 360L007 (STS-33R) Final Report, D. M. Garecht, 4 Jun 1990.

Appendix A  
LH Aft Field Joint Anomaly Documentation

POSTFIRE OBSERVATION RECORD (PFOR) A-4  
Field Joint External Insulation Condition

Motor No.: 360L007	Side: Left (A)	Date: 11/26/89
Assessment Engineer(s): T. MORGAN, S. HICKEN		
Joint: Aft (AFT)		

Field Joint External Insulation Observations:	Yes	No	Comment #
A. Charred/Heat Affected Material (HTAFF)?	_____	✓	_____
B. Missing TPS Material > 0.7 cu. In. Due To Ascent/Motor Operation (TPSVD)?	_____	✓	_____
C. Missing TPS Material > 0.7 cu. In. Due To Reentry/Debris/Water Impact (TPSDM)?	_____	✓	_____
D. Unbonds/Cracks (DEBND)?	✓	_____	1
E. Evidence of Water Leakage From Field Joint (WATER)?	_____	✓	_____
F. Missing/Unbonded Vent Valves (MISSG)? (FWD, CTR, and AFT joints only.)	_____	✓	_____

Record the following if any of the above conditions exist:

Condition (Observation Code)	Starting Station Location (In.)	Ending Station Location (In.)	Starting Degree Location (deg.)	Ending Degree Location (deg.)	Circum- ferential Width (In.)	Axial Length (In.)	Radial Depth (In.)	Volume (In. <sup>3</sup> )
DEBND	1491.5	N/A	~ 45	N/A	2 IN.	N/A	< .10	N/A

Notes / Comments

1. CRACKS IN KENA CLOSEOUT OVER TRUNNION

Clarification sheet(s) attached? \_\_\_\_\_ no A-4B yes (Provide clarification number(s).)

REVISION \_\_\_\_\_

DOC NO. TWR-17546 VOL VII  
SEC \_\_\_\_\_ PAGE \_\_\_\_\_

**Aft Segment TPS Clarification Form**

Motor No.: 360L007	Side: <input checked="" type="checkbox"/> Left (A) <input type="checkbox"/> Right (B)	Date: 11/26/89
Assessment Engineer(s): T. MORGAN, S. HICKEN		

Sketch Aft Segment TPS Observations Below:

Clarification Number: A-4B

Corresponding Comment Number(s): 1

REVISION \_\_\_\_\_

# SRB/SRM POSTFLIGHT HARDWARE ASSESSMENT SQUAWK SHEET

Page

1 of 1

2. DETECTED DURING <b>OPEN ASSESSMENT</b>		3. WORK AREA <b>ON DOCK</b>		4. SQUAWK ID NUMBER		4A. SIB SKE <input checked="" type="checkbox"/> LII <input type="checkbox"/> RII	
5. WORK UNIT CODE <b>INSULATION</b>		6. PART NAME <b>FIELD JOINT PROTECTION SYSTEM</b>		7. PART NUMBER <b>1176803-01</b>		8. SERIAL NUMBER	
11. PHA/RN <b>FINAL</b>		12. STS NUMBER <b>33</b>		13. REPORTED BY (NAME/ORG) <b>S. HICKEN / THIOKOL</b>		14. DATE/TIME <b>26 NOV 87 / 12:00</b>	
15. PHOTOGRAPH ID NUMBER <b>114472-1</b>				16A. PHOTO ORGANIZATION <input type="checkbox"/> USPI <input checked="" type="checkbox"/> XMTI <input type="checkbox"/> OTHER			

16. ITEM	17. PROBLEM DESCRIPTION
	The left-hand aft field joint transition location at 45° which was potted in with K5NA had two cracks. The cracks were parallel (0.25 inches apart) and extended 2 inches circumferentially. The cracks were opened approximately 0.1 inches. The material between the cracks could be depressed by moderate thumb pressure.

18. ASSESSMENT TEAM CONCURRENCE

Stere Hicken  
CONTRACTOR ASSESSMENT ENGINEER

Paul L. Gammon  
MSFC ASSESSMENT ENGINEER

19. EXECUTIVE BOARD DISPOSITION

PR REQUIRED ☐

PR NOT REQUIRED ☐

20. PR NUMBER

21. EXECUTIVE BOARD REMARKS

22. APPROVALS

CONTRACTOR BOARD MEMBER/DATE

BOARD CHAIRMAN/DATE

# POSTFIRE ANOMALY RECORD (PFAR)

1. PFAR NUMBER 360L007A-03	3. INSPECTION LOCATION KSC X T-24/T-97	4. REFERENCE SQUAWK NUMBER 33-030	5. REFERENCE PR NUMBER PV6-146109
2. SRM MOTOR NUMBER 360L007A	H-7 A-2	6. REFERENCE IFA NUMBER N/A	7. REFERENCE SPR NUMBER N/A
8. TITLE CRACK IN K5NA CLOSEOUT OVER FJPS TRUNNION			
9. CLASSIFICATION OBSERVATION X MINOR ANOMALY MAJOR ANOMALY CRITICAL ANOMALY			
10. PART NUMBER 1U76803-01	11. SERIAL NUMBER N/A	12. PART DESCRIPTION FIELD JOINT PROTECTION SYSTEM	
13. REPORTED BY (NAME / ORGANIZATION / OBSERVATION DATE) S. V. HICKEN / THERMAL INSULATION DESIGN ENGINEERING / 11/26/89			
14. RESPONSIBLE COMPONENT TEAM / PROGRAM MANAGER JPS / G. L. STEPHENS			
15. RESPONSIBLE PROJECT ENGINEER (NAME / ORGANIZATION) R. S. JENSEN / SYSTEMS INTEGRATION ENGINEERING			
16. RESPONSIBLE DESIGN ENGINEER (NAME / ORGANIZATION) C. L. PROKOP / STAGE HARDWARE DESIGN			
17. DESCRIPTION (ATTACH PFOR, FIGURES, PHOTOGRAPHS, ETC.) Two circumferential splits were found in the K5NA on the aft field joint at approximately 30 degrees measuring approximately 2.0 inches wide by 0.10 inch deep. The splits were about 1.25 inches apart. The K5NA around the splits was bulged out approximately 0.10 inch, was spongy, and could be depressed approximately 0.10 inch with hand pressure.			
18. JUSTIFICATION OF CLASSIFICATION (POSTFIRE ENGINEERING EVALUATION LIMITS) The K5NA split occurred during descent. This condition was noted on a previous flight (360H005) and has no impact on flight schedule or safety. No new corrective action will be implemented.			
19. CAUSE Vacuum under the moisture seal during descent caused the moisture seal to be pulled down over the pin retainer band trunnion. The resulting stress in the K5NA induced a split.			
20. RECOMMENDED CORRECTIVE ACTION None.		21. ANOMALY APPROVAL SIGNATURE RPRB SECRETARY: /S/S. T. MUNSON DATE: 12/13/89	
		22. OBSERVATION/ANOMALY APPROVAL SIGNATURES PE: /S/R. S. JENSEN DATE: 12/20/89 PM: /S/G. L. STEPHENS DATE: 01/05/90	
23. RESULTS OF RECOMMENDED CORRECTIVE ACTION N/A		24. REPORT RESULTS TO RPRB? YES NO X	
		25. RPRB CLOSURE SIGNATURE (REQUIRED ONLY IF BLOCK 24 CHECKED "YES") RPRB SECRETARY: N/A DATE: N/A	
		26. OBSERVATION/ANOMALY CLOSURE SIGNATURE PM: /S/G. L. STEPHENS DATE: 01/05/90	
27. ORIGINATION DATE 12/13/89	28. REQUIRED STATUS DATE 12/15/89	29. PR CLOSURE DATE	30. PFAR CLOSURE DATE 01/05/89

REV. 3/28/89

TWR-17546 VOL. VII  
Page

**PR CLOSURE APPROVAL**

Ref. P.F.A.R. Number: 360L007A-03

**Engineering Approval**

Signature

*W. D. Hand*

Date

*2/6/90*

**Quality Assurance Approval**

*M. B. Johnson*  
Signature

Date

*2/13/90*

**N.A.S.A. Resident Q.A. Approval**

*J. G. Lewis*  
Signature

Date

*2/13/90*

**N.A.S.A. R.M.O. Manager Approval**

*E. J. Krobiszewski*  
Signature

Date

*2/13/90*

**N.A.S.A. S.R.M. Chief Engineer Approval**

*[Signature]* FOR K. JONES  
Signature

Date

*2-20-90*







Kennedy Space Center/Vandenberg Air Force Base

# NONCONFORMANCE SYSTEM (CONTINUATION SHEET)

☒ PR PV6-146109  
☐ DR  
☐ CAAR

1 OF

2. DETECTED DURING

3. RESERVED

4. END ITEM CONTROL NO.

D-BI-0342-0008

5. ITEM

6. TECH

7. CONTR  
QA

8. GOVT  
QA

1.1 TRANSFER THIS PR TO THOROL CORP.  
RECORD TRACKING NUMBER.

TRACKING NUMBER: 36010074-03  
ACCEPTED BY: John D. Miller 11/29/89  
THI LSS-OE

## SUMMARY CLOSURE

PR WAS TRANSFERED TO  
THOROL CORP.

1.2 CLOSE THIS PR.

LSOC SE: Robert Ramo 11/29/89

NASA SE: Bruce Anderson 11/29/89

THI LSS: Mike Hurling 11/29/89

SPC OE: Mike Beller 11/29/89  
OE 155 SPC

9. CLOSURE

NOV 29 89

SPC  
247

## Appendix B

### LH Forward Field Joint Anomaly Documentation

POSTFIRE OBSERVATION RECORD (PFOR) A-4  
Field Joint External Insulation Condition

Motor No.: 360L007	Side: Left (A)	Date: 11/26/89
Assessment Engineer(s): T. MORGAN, S. HICKEN		
Joint: Forward (FWD)		

Field Joint External Insulation Observations:	Yes	No	Comment #
A. Charred/Heat Affected Material (HTAFF)?	_____	✓	_____
B. Missing TPS Material > 0.7 cu. in. Due To Ascent/Motor Operation (TPSVD)?	_____	✓	_____
C. Missing TPS Material > 0.7 cu. in. Due To Reentry/Debris/Water Impact (TPSDM)?	_____	✓	_____
D. Unbonds/Cracks (DEBND)?	✓	_____	1
E. Evidence of Water Leakage From Field Joint (WATER)?	_____	✓	_____
F. Missing/Unbonded Vent Valves (MISSG)? (FWD, CTR, and AFT joints only.)	_____	_____	_____

Record the following if any of the above conditions exist:

Condition (Observation Code)	Starting Station Location (In.)	Ending Station Location (In.)	Starting Degree Location (deg.)	Ending Degree Location (deg.)	Circum- ferential Width (In.)	Axial Length (In.)	Radial Depth (In.)	Volume (In. <sup>3</sup> )
DEBND	N/A	N/A	240	260	~ 3 FT.	~ .50 IN.	< .10	N/A

**Notes / Comments**

1. NUMEROUS SMALL CRACKS ON FWD EDGE OF JPS CORK.  
TWO IMPACT MARKS (POSSIBLE PARACHUTE FLAT LINE) ON EACH SIDE OF AFFECTED AREA

Clarification sheet(s) attached? \_\_\_\_\_ no \_\_\_\_\_ A-4A yes (Provide clarification number(s).)

REVISION \_\_\_\_\_

DOC NO. TWR-17546 VOL VII  
SEC \_\_\_\_\_ PAGE \_\_\_\_\_

Forward Segment TPS Clarification Form

Motor No.: 360L007	Side: <input checked="" type="checkbox"/> Left (A) <input type="checkbox"/> Right (B)	Date: 11/26/89
Assessment Engineer(s): T. MORGAN, S. HICKEL		

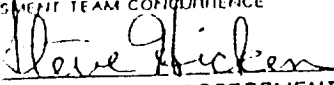

Sketch Forward Segment TPS Observations Below:

Clarification Number: A-4A

Corresponding Comment Number(s): 1

REVISION \_\_\_\_\_

DOC NO. TWR-17546 VOL VII  
SEC PAGE

SRB/SRM POSTFLIGHT HARDWARE ASSESSMENT SQUAWK SHEET								Page 1 of 1	
2. DETECTED DURING <b>OPEN ASSESSMENT</b>			3. WORK AREA <b>ON DOCK</b>		4. SQUAWK ID NUMBER		4A. SRB SIDE <input checked="" type="checkbox"/> LH <input type="checkbox"/> RH		
5. WORK UNIT CODE <b>INSULATION</b>		6. PART NAME <b>FIELD JOINT PROTECTION SYSTEM</b>			7. PART NUMBER <b>1076 803-01</b>		8. SERIAL NUMBER		9. QUANTITY <b>1</b>
11. PHA/PH <b>FINAL</b>		12. STS NUMBER <b>33</b>		13. REPORTED BY (NAME/ORG) <b>S. HICKEN / THICKOL</b>			14. DATE/TIME <b>26 NOV 89 / 12:00</b>		
16. PHOTOGRAPH ID NUMBER <b>114470-5</b>				16A. PHOTO ORGANIZATION <input type="checkbox"/> USBI <input checked="" type="checkbox"/> AMTI <input type="checkbox"/> OTHER					
16. ITEM	17. PROBLEM DESCRIPTION  The left hand forward field joint forward edge from 240° to 260° exhibited two possible impact marks approximately 3 feet apart. Numerous small surface cracks were on the forward facing edge between the marks.								
18. ASSESSMENT TEAM CONCURRENCE									
 <b>Steve Hicken</b> CONTRACTOR ASSESSMENT ENGINEER					 <b>Paul G. Gorman</b> MSFC ASSESSMENT ENGINEER				
19. EXECUTIVE BOARD DISPOSITION									
<input type="checkbox"/> PR REQUIRED <input type="checkbox"/> PR NOT REQUIRED									
20. PR NUMBER									
21. EXECUTIVE BOARD REMARKS									
22. APPROVALS									
_____ CONTRACTOR BOARD MEMBER/DATE					_____ BOARD CHAIRMAN/DATE				

# POSTFIRE ANOMALY RECORD (PFAR)

1. PFAR NUMBER 360L007A-05	3. INSPECTION LOCATION KSC X T-24/T-97	4. REFERENCE SQUAWK NUMBER 33-031	5. REFERENCE PR NUMBER PV6-146407
2. COMPONENT PROGRAM TEAM JPS	H-7 A-2	6. REFERENCE IFA NUMBER N/A	7. REFERENCE SPR NUMBER N/A
8. TITLE IMPACT MARKS/SURFACE CRACKS ON FORWARD FIELD JOINT FJPS			
9. CLASSIFICATION OBSERVATION MINOR ANOMALY X MAJOR ANOMALY CRITICAL ANOMALY			
10. JUSTIFICATION OF CLASSIFICATION This is a first-time occurrence but this condition imposes no impact on flight safety or schedule.			
11. PART NUMBER 1U76803-01	12. SERIAL NUMBER N/A	13. PART DESCRIPTION FIELD JOINT PROTECTION SYSTEM	
14. REPORTED BY (NAME / ORGANIZATION / OBSERVATION DATE) S. V. HICKEN / THERMAL INSULATION DESIGN ENGINEERING / 11/26/89			
15. RESPONSIBLE PROGRAM MANAGER (NAME / ORGANIZATION) G. L. STEPHENS / JPS PROGRAM MANAGEMENT		16. RESPONSIBLE POSTFIRE ENGINEER (NAME / ORGANIZATION) G. S. NIELSON / POSTFIRE HARDWARE ENGINEERING	
17. RESPONSIBLE INTEGRATION ENGINEER (NAME / ORGANIZATION) R. S. JENSEN / SYSTEMS INTEGRATION ENGINEERING		18. RESPONSIBLE ACTIONEE (NAME / ORGANIZATION) C. L. PROKOP / STAGE HARDWARE DESIGN	
19. DESCRIPTION (ATTACH PFORS, FIGURES, PHOTOGRAPHS, ETC.) Numerous small cracks were observed on the forward edge of the forward field joint FJPS cork from 240 to 260 degrees. Impact marks were noted on each side of the affected area approximately 3 feet apart. The cracks measured approximately 0.50 inch axially by less than 0.10 inch radially.			
20. HISTORY None. This is the first time that cracks of this type have been reported.			
21. CAUSE Cracks of this size meet the current material acceptance requirements. The impact marks were most likely caused by a parachute float line.			
22. CORRECTIVE ACTION Add a limit to the PEEL stating that cracks in the FJPS that meet current acceptance criteria are acceptable and should not be reported.			
23. RESULTS TWR-50050, Vol. I, Rev. C will state "Cracked cork or K5NA with no missing material - Acceptable".			
24. REPORT RESULTS TO RPRB? YES NO X	26. APPROVAL THROUGH CORRECTIVE ACTION RPRB SECRETARY: DATE: /S/S. T. MUNSON 12/13/89 SIE: DATE: /S/R. S. JENSEN 12/20/89 PM: DATE: /S/G. L. STEPHENS 01/05/90		27. CLOSURE RPRB SECRETARY: DATE: N/A N/A PM: <i>G. L. Stephens</i> DATE: 10 July 90
25. RPRB MEETING DATES ORIGINATION: 12/13/89 CLOSURE: N/A			

REV. 2/1/90

TWR-17546 VOL. VII

Page

PR CLOSURE APPROVAL

Ref. P.F.A.R. Number: 360L007A-05

Engineering Approval

Signature

*W. P. Hant*

Date

2/6/90

Quality Assurance Approval

Signature

*AB Johnson*

Date

2/13/90

N.A.S.A. Resident Q.A. Approval

Signature

*J. G. Lewis*

Date

2/13/90

N.A.S.A. R.M.O. Manager Approval

Signature

*E. J. Skobiszewski*

Date

2/13/90

N.A.S.A. S.R.M. Chief Engineer Approval

Signature



*Ross for K. Jones*

Date

2-20-90



PRESS FIRMLY - ALL COPIES MUST BE LEGIBLE

 			1. REPORT NUMBER <input type="checkbox"/> INTERIM PROBLEM REPORT <input checked="" type="checkbox"/> PROBLEM REPORT <u>PV 6 146407</u> <input type="checkbox"/> DISCREPANCY REPORT			PAGE  OF	
2. DETECTED DURING <u>OPEN ASSESSMENT</u>		3. WORK AREA <u>HANGAR A.F</u>		4. END ITEM CONTROL NUMBER <u>D-B1034L-0011</u>			
5. WORK UNIT CODE		6. PART/PROG NAME <u>FIELD JOINT PROTECTION SYSTEM</u>		7. PART/PROG NO. <u>1476803-01</u>		8. SER./REV NO. <u>N/A</u>	
9. QTY <u>1</u>		10. FSCM/VENDOR <u>07703</u>		11. NHA/PN/TAPE/DISC ID. <u>10100-001</u>		12. STS #/EFF. <u>000B034L</u>	
13. REPORTED BY (NAME/ORG) <u>S. HICKEN TH1</u>		14. DATE <u>11-26-89</u>		15. SOFTWARE PROBLEM LOCATOR DATE _____ TIME _____ <input type="checkbox"/> DUMP <input type="checkbox"/> TRANSLATOR OUTPUT <input type="checkbox"/> LINE PRINTER OUTPUT <input type="checkbox"/> COMPILER LISTING <input type="checkbox"/> OTHER (SPECIFY)		16. ITEM <u>1.0</u>	
17. PROBLEM DESCRIPTION <u>L/H FWD FIELD JOINT FORWARD EDGE FROM 240' to 260' EXHIBITED TWO POSSIBLE IMPACT MARKS APPX. 3 FEET APART. NUMEROUS SMALL SURFACE CRACKS WERE ON THE FORWARD FACING EDGE BETWEEN THE MARKS.</u>		17A. VALIDATION <u>Richard R. Smith per telecon. D. Thomas TH1 DA Sgr</u>		11-20-89		REF SQAWK 33-031	
18. CRIT. SKILLS <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		19. ENG. CHANGE REQ. <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		20. CONSTRAINTS: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO TO:		21. CRIT <u>3/3</u>	
22. RESP ORG. <u>LSOC</u>		23. WEIGHT RECD <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		24. RETEST RECD <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		25. HAZARDOUS OP <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:	
26. MR RECD <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		27. TIME/CYCLE <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		28. FRACTURE CRIT <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		29. ITEM	
30. DISPOSITION/CAUSE/CORRECTIVE ACTION <u>SEE PG 2 FOR DISPO</u>		31. TECH		CONTR QA		GOVT QA	
32. SYSTEM RESTORED (SIGNATURE) _____ DATE _____		33. FINAL ACCEP DATE _____		34. DATA CODE <u>B1081P</u>		35. REPL. S/N	
36. RELATED REPORTS		37. RC ACTION RECD <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO ITEMS:		38. RC CONSTRAINT (SIGNATURE DATE) TO: _____		39. RC CLOSURE (SIGNATURE) _____ (DATE) _____	



NONCONFORMANCE SYSTEM  
(CONTINUATION SHEET)

1. REPORT NUMBER  
☐ IPR  
☒ PR PV6-196 407  
☐ DR  
☐ CAAR

PAGE  
2  
OF

2. DETECTED DURING  
3. RESERVED  
4. END ITEM CONTROL NO. D-010346-0011

5. ITEM	6. TECH	7. CONTR QA	8. GOVT QA
1.1 TRANSFER THIS PR TO TH1 CORP.			
TRACKING NO. <u>5606007A-05</u>			
ACCEPTED BY: <u>[Signature]</u> <u>12/1/89</u> <u>TC-LSS-95</u>			
SUMMARY CLOSURE			
PR WAS TRANSFERRED TO TH10KOL CORP.			
1.2 CLOSE THIS PR			
LSOC SE: <u>[Signature]</u> <u>12/1/89</u>			
NASA SE: <u>[Signature]</u> <u>11-30-89</u> <u>MUELLER</u>			
TH1 LSS: <u>[Signature]</u> <u>12/1/89</u>			
SPL DE:			

9. CLOSURE

PRESS FIRMLY - ALL COPIES MUST BE LEGIBLE

## DISTRIBUTION

<u>Recipient</u>	<u>No. of Copies</u>	<u>Mail Stop</u>
G. Stephens	1	E66
R. Jensen	1	L72
R. Wilks	1	L62
M. Williams	1	L62B
J. Wilkinson	1	L62B
D. Garecht	1	L71
T. Morgan	1	L52
E. Bailey	1	694
R. Mikesell	1	811
E. Rodgers	1	851
P. Greenhalgh	1	851
Print Crib	5	K23B1
Stage Hardware File	1	L62B
Data Management	1	L74B
R. Papasian	15	E05

